ISOPHOT Mapping of Vega-type Circumstellar Dust

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We searched for far-infrared (60 μm) extended emission, in the form of circumstellar dust disks, in the maps of seven main-sequence stars. Direct detection of circumstellar disks in these systems can advance our understanding of the Vega phenomenon and the nature of protoplanetary disk candidates.

We obtained 60 μm maps with the PHOT C-100 3×3-pixel far-infrared camera on-board ISO, in the P32 microscanning dedicated mapping mode. The maps span 6'15"×5' 45" (RA×decl), at a spatial resolution of $\approx$ 30". The maps presented here were obtained with integration times of 128 seconds at each spacecraft raster position. These integration times are 4 times larger than in previous similar maps of Vega-type stars obtained by Fajardo-Acosta, Stencel, & Backman (1997, ApJ, **487**, L151; 1998, ApJ, **503**, L193, hereafter FSB). Our goal was to increase S/N in the newer maps by a factor of 2 with respect to the previous ones.

The stars we observed are γ Oph (A0 V), α PsA (A3 V), γ Tri (A1 Vnn), 61 Cyg A (K5 V), τ^1 Eri (F5-6 V), τ Cet (G8 V), and ϵ Eri (K2 V). These systems are nearby, within 30 pc from us, and are suspected to harbor Vega-like circumstellar dust disks (Backman & Paresce 1993, Protostars & Planets III, ed. Levy & Lunine, 1253). We compared the maps of these systems with similar maps of the stars α Boo and α Aql, which do not possess circumstellar dust. We discuss techniques to model point-spread functions (PSFs) from the latter, and their subtraction from our Vega-type stellar maps.

We did not spatially resolve extended emission in the maps of γ Tri, 61 Cyg A, and τ Cet, upon comparison with our modeled PSFs. We could only marginally detect a ring of 60 μm emitting dust around ϵ Eri, previously reported by Fajardo-Acosta, Stencel, & Backman (1998, BAAS, **193**, 69.07). This detection remains tentative.

The maps of γ Oph, α PsA, and τ^1 Eri definitely show extended emission when compared with model PSFs. We confirmed the previous detection in α PsA by FSB, but now can detect extended emission as far as $\sim$ 700 AU from the star, as opposed to $\sim$ 500 AU in the previous observations. The detection in γ Oph was only hinted at by FSB. The detection of extended emission around τ^1 Eri is reported for the first time here.